Title	*Spurious Storage Ring Vacuum Chamber Microwave Mode Dampers*			
Project Requestor	Glenn Decker			
Date	March 28, 2008			
Group Leader(s)	Glenn Decker			
Machine or Sector Manager	Louis Emery			
Category	Beam Stability			
Content ID*	APS_XXXXXX	Rev.	ICMS_Revision	ICMS Document Date

*This row is filled in automatically on check in to ICMS. See Note [1]

Description:

Start Year (FY)	FY08	Duration (Yr)	5

Objectives:

Eliminate / reduce the spurious microwave vacuum chamber modes which impact the measurement of vertical beam position in the storage ring. These modes affect beam position monitor (bpm) readbacks associated with the large-aperture vacuum chambers; a total of up to 200 chambers are involved.

Benefit:

Improved long- and short-term vertical beam stability.

Risks of Project: See Note [2]

To do a proper job of it, each of the 200 vacuum chambers of this type would have to be opened to allow for the insertion of mode dampers or other hardware, however a total of 80 chambers would see the greatest improvement. Beam lifetime will be affected following each of these activities, which will be conducted on a per sector basis, since gate valves can isolate individual sectors. Risks are the same as any vacuum system intervention, however in this case the cumulative risk is somewhat higher due the large number of vacuum interventions.

Consequences of Not Doing Project: See Note [3]

A total of 360 vertical bpm readings will remain unreliable at some level. Curved vacuum chambers (80 total, 160 bpms) are affected most strongly by these modes. This has limited our knowledge of the vertical stability of bending magnet source position, and has alsoimpacted insertion device stability. Increasing the number of reliable bpms will improve global stability since a larger response matrix can be used for both AC and DC feedback.

Cost/Benefit Analysis: See Note [4]

> To date, vertical orbit correction has made do with photon bpms, rf bpms associated with small-aperture insertion device vacuum chambers, and a limited number of rf bpms which use pickup electrodes mounted on the large-aperture chambers. This has severely constrained our ability to reliably stabilize the vertical orbit, especially for bending magnet source points. For certain fill patterns, most notably the hybrid fill pattern, glitches and steps in the affected vertical bpm readbacks impact the insertion device source points. It likely will cost on the order of $5k for each vacuum chamber, which should fix one or two bpm readbacks. As things now stand, there is great uncertainty as to the amont of vertical beam motion between adjacent insertion device source points, so even 2 or 4 good bpm readings would be an enormous help in stabilizing the orbit. While it will likely be unjustifiable to spend $1M to fix the whole ring, a modest investment to fix 2 of the 5 chambers per sector at a cost of $400k over five years is proposed. This would add as many as 160 new reliable vertical bpm readings to our orbit correction algorithm.

Description:

> During the first year, a first production version of the modifications will be engineered and tested using spare vacuum chambers. During the remaining four years, the modfications will be made at all storage ring sectors, making modifications to 80 vacuum chambers. This will require three sectors to be modified during each of the three annual month-long maintenance periods.

Funding Details

Cost: ($K)
Use FY08 dollars.

Year	AIP	Contingency
1	100	10
2	100	10
3	100	10
4	50	5
5	50	5
6		
7		
8		
9		
Total	400	40

Contingency may be in dollars or percent. Enter figure for total project contingency.

Effort: (FTE)

The effort portion need not be filled out in detail by March 28

Year	Mechanical Engineer	Electrical Engineer	Physicist	Software Engineer	Tech	Designer	Post Doc	Total
1	0.25	0.1	0.02		0.1	0.2		0.67
2					1			1
3					1			1
4					1			1
5					1			1
6								0
7								0
8								0
9								0

Notes:

[1] **ICMS**. Check in first revision to ICMS as a *New Check In*. Subsequent revisions should be checked in as revisions to that document i.e. C*heck Out* the previous version and C*heck In* the new version. Be sure to complete the *Document Date* field on the check in screen.

[2] **Risk Assessment.** Advise of the potential impact to the facility or operations that may result as a consequence of performing the proposed activity. Example: If the proposed project is undertaken then other systems impacted by the work

include ... (If no assessment is appropriate then enter NA.)

[3] **Consequence Assessment.** Advise of the potential consequences to the facility or to operations if the proposal is not executed. Example: If the proposed project is not undertaken then _____ may happen to the facility. (If no assessment is appropriate then enter NA.)

[4] **Cost Benefit Analysis.** Describe cost efficiencies or value of the risk mitigated by the expenditure. Example: Failure to complete this maintenance project will result in increased total costs to the APS for emergency repairs and this investment of ____ will also result in improved reliability of _____. (If no assessment is appropriate then enter NA.)